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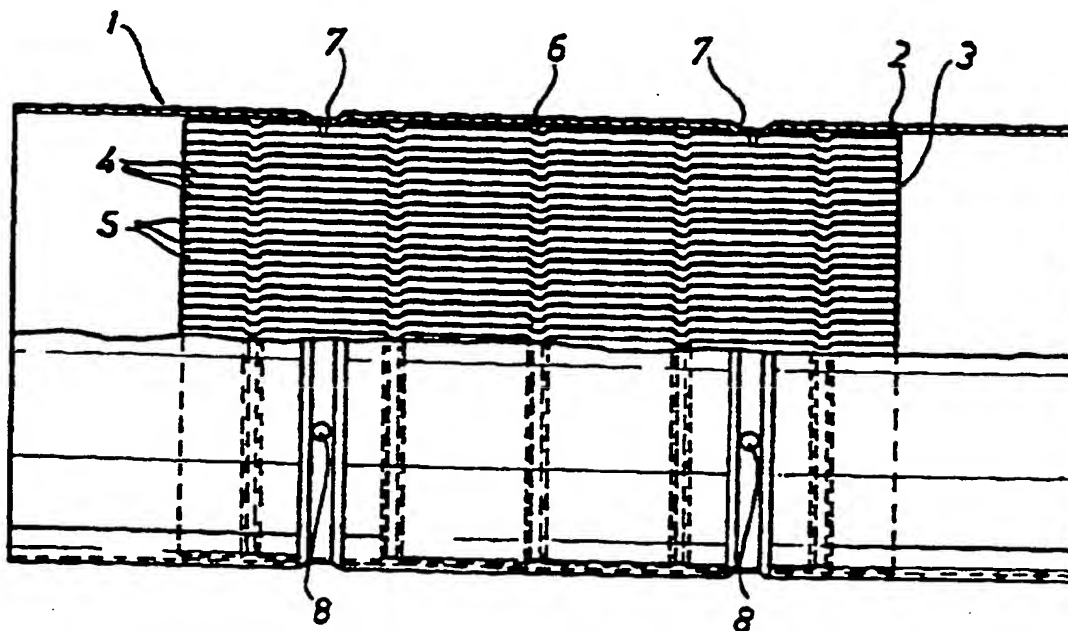
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(54) Title: A CATALYST CARRIER ARRANGEMENT



(57) Abstract

The invention concerns a carrier arrangement for catalytic converters comprising a catalyst body (1) consisting of a monolith (3) formed of carrier members designed to support a catalytic material, and of a metal casing (2, 9) enclosing the monolith (3). The interior width of the casing (2, 9) exceeds that of the monolith (3) whereby a gap (6, 11) forms between the casing (2, 9) and the monolith (3). This gap (6, 11) is bridged at least in the area of a section (7, 10) extending circumferentially around the monolith (3), the monolith (3) being attached to the casing (2, 9) along said section (7, 10).

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A CATALYST CARRIER ARRANGEMENT

The subject invention concerns a carrier arrangement for catalytic converters.

As substrates to be used to support the catalytic material in internal combustion engine exhaust systems ceramic materials are predominantly used. In latter
5 years, metal substrates have, however, come into use to an increasingly large extent. The advantage of metal substrates is their ability to reach working temperatures more rapidly than do ceramic ones, as accordingly they
10 begin their exhaust gases purification function at an earlier stage after start, which is a most essential feature. Moreover, metal substrates are more efficient thermal conductors, and thus they may be heated more quickly and the risk of local overheating is reduced. In
15 addition, metal substrates support higher temperatures than ceramic ones.

As carrier members supporting the catalytic material so called metal monoliths are used. These consist of metal foils, preferably of stainless steel, wound into
20 rolls wherein metal foils of flat configuration alternate with metal foils of corrugated configuration, whereby throughflow channels extending through the catalyst body are formed. The foil thickness is small, normally only about 0.05 mm. The catalyst body also includes a metal
25 cover forming a jacket surrounding the monolith in contact with the latter. The cover thickness may amount to approximately 1 - 1.6 mm.

When the hot exhaust gases flow through the monolith during the combustion engine operation the thin carrier
30 member foils are heated very rapidly. Usually, the temperature quickly reaches between 500 and 800°C. In some types of engines, the temperature may rise to the range of up to between 1100 and 1200°C. As soon as the

engine stops, the temperature of the catalyst body rapidly sinks to the level of the ambient temperature.

The repeated temperature changes constitute a problem that affects the catalyst long-term durability. The rapidly heated thin foils of the monolith also expand quickly. The surrounding casing, in abutment against the monolith but not in close contact with the exhausts and in addition having a larger material thickness, is heated and expands at a slower pace. During the heating, the casing thus prevents the monolith from expanding, which gives rise to considerable radial compressive forces that cause deformations to form in the monolith. When the abovementioned high temperature levels are reached, the strength of the metal also is reduced considerably, often down to about 10% of its strength at room temperature, which aggravates the deformations and reduces the monolith life further.

When the engine is stopped and the exhausts cool down the opposite phenomenon occurs, i.e. the monolith foils cool at a higher speed than the surrounding thicker casing. As a result, considerable tensile forces generate between the outermost part of the monolith and the cover.

For the reasons outlined in the foregoing, considerable problems are involved as regards the attachment of metal monoliths in their casings. Several various solutions have been proposed and tested, but often with poor results. Some viable constructions have been developed, e.g. by the German company Emitec GmbH, but they are comparatively complex and expensive. A feature common to all these prior-art solutions is that they apply to monoliths wherein the various metal foil layers are interconnected by means of soldering, with the outermost layer being soldered to the surrounding jacket.

The subject invention provides a simple, reliable and economical solution to the securement problem. The solution functions both when applied to metal monoliths soldered together in the manner indicated above and when

applied to metal monoliths joined together in some other manner, without soldering. The characteristic features of the attachment arrangement appear from the appended claims.

5 The invention will be described in closer detail in the following with reference to the accompanying drawings, wherein

Fig. 1 is a broken schematical longitudinal sectional view through a catalyst body,

10 Fig. 2 is a similar schematical longitudinal sectional view through a catalyst body showing a modified arrangement of attachment in accordance with the invention, and

Fig. 3 is a larger-scale view of a part of the attachment arrangement in accordance with the invention.

15 Fig. 1 illustrates a basic design of the inventive object. A catalyst body 1 comprises a metal casing 2 enclosing a so called monolith 3. The latter in turn consists of carrier members, designed to support a
20 catalytic material and consisting of helically wound metal foils; arranged so that flat metal foils 4 alternate with corrugated metal foils, so as to form through-flow channels 5 extending through the catalyst body 1. The monolith 3 has a width or diameter that is
25 slightly smaller than the internal width of the casing 2. Accordingly, a gap 6 forms between the casing 2 and the monolith 3, the size of which varies within different temperature ranges.

30 In accordance with the invention, the casing 2 is provided with at least one band-like depression 7, in accordance with the embodiment illustrated in the drawing figure with two such depressions, the gap 6 around the monolith 3 thus being eliminated in the area opposite
35 said depressions. Along these depressions 7 the casing 2 and the monolith 3 are interconnected, preferably only at spaced intervals 8, for instance by means of soldering or welding..

When the monolith 3 is heated by the exhaust gases flowing through it, the monolith 3 expands quicker than the casing 2, which is due partly to the more intimate contact of the monolith 3 with the hot exhaust gases, partly to the larger material thickness of the casing 2. The expansion may now take place essentially unimpededly, with the exception of in the area of the depressions 7 where a certain deformation of the outermost foil 4 of the monolith 3 will take place. Consequently, no compressive forces will generate along the major part of the surface of the monolith 3. When the casing and the monolith 3 again cool down, the monolith 3 may again retract and thus again open up a gap 6.

Because the monolith 3 is exposed only to minor local deformations in the area of the depressions 7 and is allowed to expand and contract freely elsewhere, the catalyst body 1 may operate in an intact condition over a longer period than has hitherto been possible, with consequential increase of its serviceable life.

Further improvements may be achieved by omitting to join one or some of the outermost foils 4 along the entire foil length to the the foils immediately interiorly thereof but instead joining them to one another at points spaced laterally from the points 8 of attachment. When the monolith 3 cools down, with consequential contraction, the tensile forces at the points 8 of attachment will not be very pronounced because of the resiliency imparted to the outermost foils 4 between their interconnection points.

Figs. 2 and 3 illustrate a modification of the mode of attachment in accordance with the invention. In this case, an exhaust pipe 9 serves as the casing. In accordance with this modification, the monolith 3 is provided at each end with a circumferential collar 10 which projects past its associated monolith end and which is attached to the exhaust pipe 9. In the same manner as in accordance with the embodiment of Fig. 1, the collars

10 preferably are attached to the monolith 3 at discrete intervals 12. The collars 10 bridge a gap 11 formed between the exhaust pipe 9 and the monolith 3, the latter thus, upon heating and cooling, being given a comparatively free space in which to expand and contract while at the same time it is securely anchored inside the exhaust pipe 9.

The invention is not limited to the embodiments as shown and described but could be modified in a variety of ways within the scope of the appended claims. For instance, the gap 6 could be eliminated by introduction of one or several inserts between the casing 2 and the monolith 3 instead of by forming depressions 7 in the casing.

CLAIMS

1. A carrier arrangement for catalytic converters of the kind comprising a catalyst body (1) which consists of a monolith (3) of carrier members designed to support a catalytic material, said carrier members formed by
5 superposed, alternately flat and corrugated metal foils (4) which are helically wound to form through-flow channels (5) extending through the catalyst body (1), and of a metal casing (2, 9), the material thickness of which exceeds that of the metal foils (4) and which casing
10 encloses the monolith (3), c h a r a c t e r i z e d in that the interior width of the casing (2, 9) exceeds that of the monolith (3), whereby a gap (6, 11) forms between the casing (2, 9) and the monolith (3), and in that said gap (6, 11) is bridged at least in the area of a section
15 (7, 10) extending circumferentially around the monolith (3), said monolith (3) being attached to the casing (2, 9) along said section (7, 10).

2. An arrangement as claimed in claim 1, c h a -
r a c t e r i z e d in that the gap (6) is bridged in
20 the area of said section (7) by a radial depression of the casing (2).

3. An arrangement as claimed in claim 1, c h a -
r a c t e r i z e d in that in the area of said section (7) the monolith (3) is attached to the casing (2) only
25 in some points (8) circumferentially around the monolith.

4. An arrangement as claimed in claim 1, c h a -
r a c t e r i z e d in that the monolith (3) is formed at each end with a circumferential collar (10) which bridges the gap (11) between the monolith (3) and the
30 casing (9) and which is attached to said casing (9).

5. An arrangement as claimed in claim 4, c h a -
r a c t e r i z e d in that the collar (10) is attached to the monolith (3) only at some points (12) along the monolith circumference.

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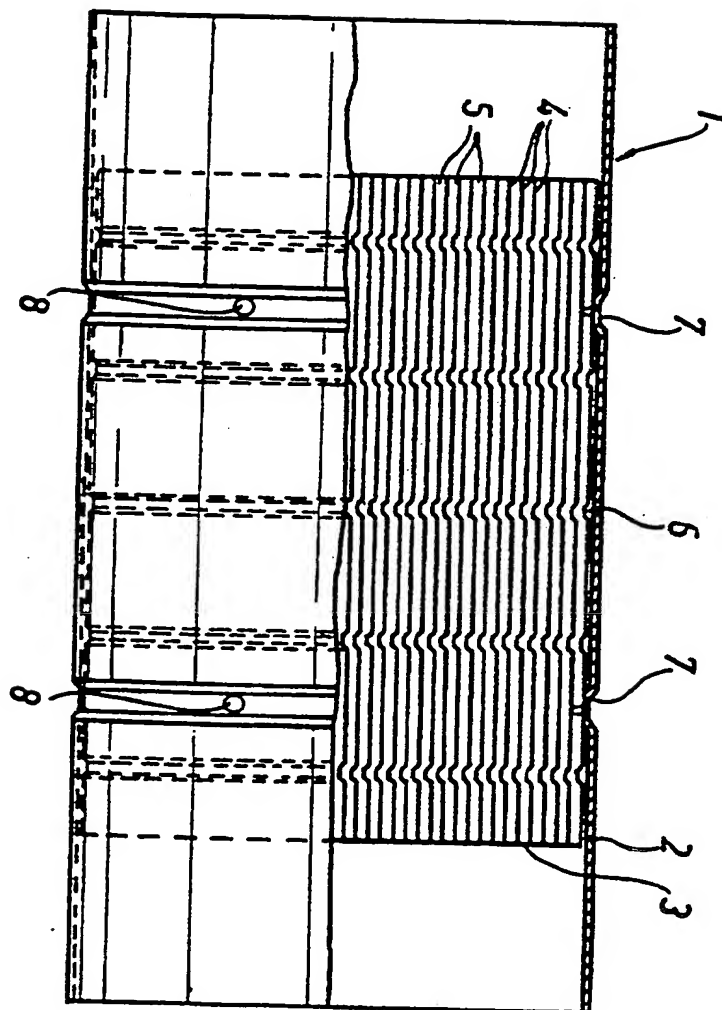
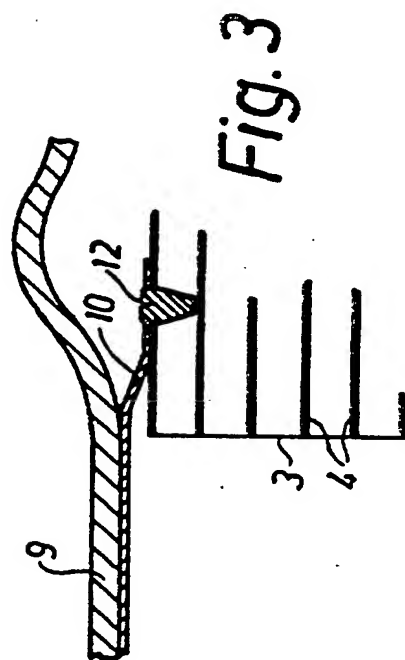
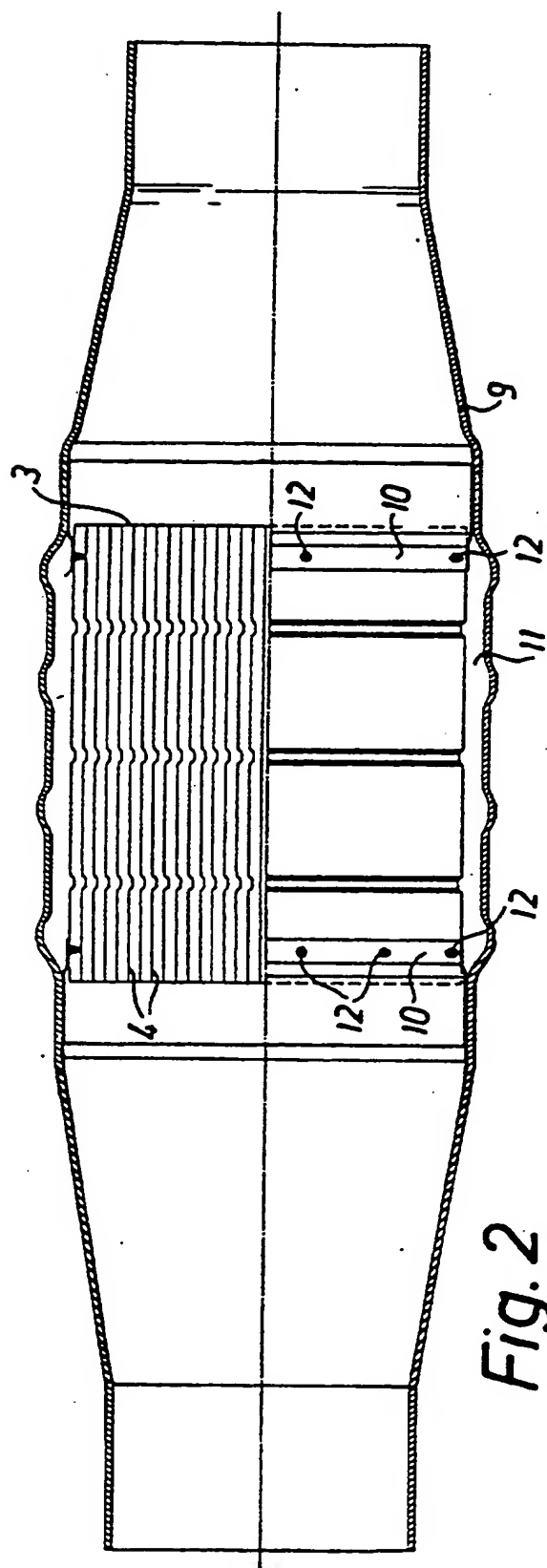


Fig. 1

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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F01N 3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0212243 A1 (INTERATOM GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG), 4 March 1987 (04.03.87), figure 1, abstract	1,3
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A	WO 9004087 A1 (EMITEC GESELLSCHAFT FÜR EMISSIONSTECHNOLOGIE MBH), 19 April 1990 (19.04.90), abstract	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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